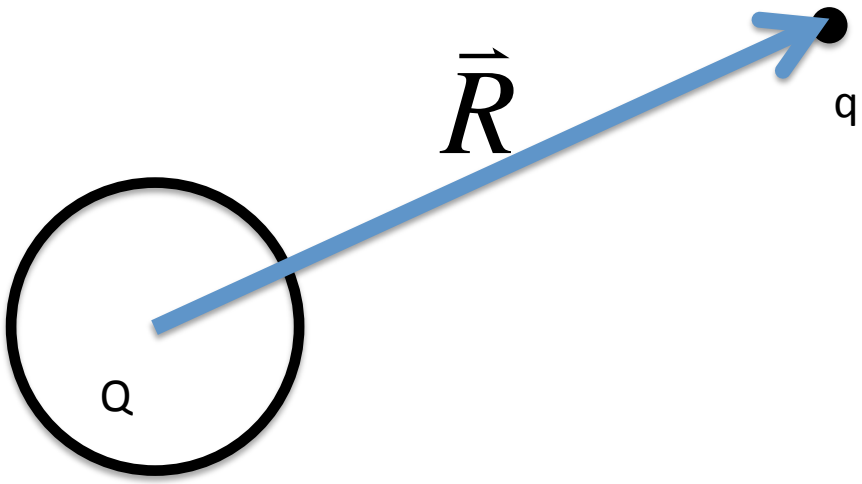
Short Quiz Question (answer by 4:35 pm)

A solid uniformly charged sphere (radius = 12 cm) has a charge density (30 nC/m^3) distributed throughout its volume. Determine the magnitude of the electric field 15 cm from the center of the sphere.

a. 22 N/C
b. 49 N/C
c. 31 N/C
d. 87 N/C
e. 26 N/C

Electric Potential Energy (Doc Cam discussion)

Example: Q stationary: how much energy does it take to bring q to the below position?

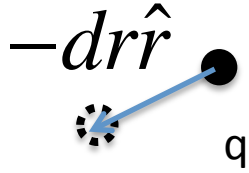


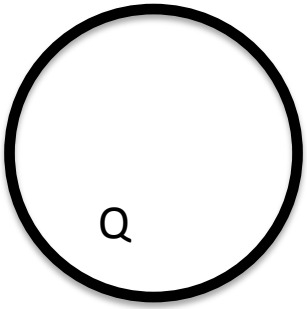
$$\vec{F} = \frac{1}{4\pi\varepsilon_0}\frac{Qq}{r^2}\hat{r}$$

At distance r

Work done by hand = Required Energy

How much energy does it take to move it an infinitesimal distance in at distance r?





$$Work = Force \times Dis\tan ce = \frac{1}{4\pi\varepsilon_0}\frac{Qq}{r^2}\hat{r}\cdot -dr\hat{r} = -\frac{1}{4\pi\varepsilon_0}\frac{Qq}{r^2}dr$$

$$Work_{total} = \int_{\infty}^{R} -\frac{1}{4\pi\varepsilon_0}\frac{Qq}{r^2}dr = \frac{1}{4\pi\varepsilon_0}\frac{Qq}{R}$$

Electric Potential Energye at R: $\frac{1}{4\pi\varepsilon_0}\frac{Qq}{R}$

Electric potential $\frac{1}{4\pi\varepsilon_0}\frac{Q}{R}$

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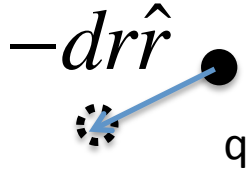

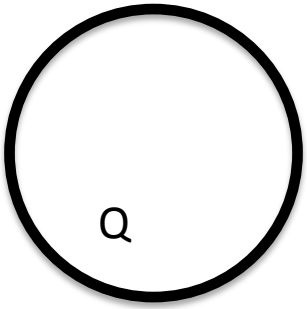

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